

**EXPERIMENTS WITH A
SLOW NEUTRON VELOCITY SPECTROMETER**

BY
FRANCE BARNET BERGER
A.B., Miami University, 1938
M.S., University of Illinois, 1939

AN ABSTRACT OF A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
PHYSICS IN THE GRADUATE SCHOOL OF THE
UNIVERSITY OF ILLINOIS, 1942

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The dueteron beam of the Illinois linear accelerator is modulated to produce periodically bursts of neutrons slowed by paraffin wax surrounding the target. The neutrons after traversing a distance of two and a half meters are detected by a boron trifluoride ionization chamber. The output of the ionization chamber is fed into an electrical analyzing circuit which sorts and registers on one of ten Cenco counters the pulses according to the associated times of flight.

This apparatus is used to determine the capture cross section of mercury for slow neutrons as a function of the neutron velocity. The cross section is found to be proportional to the reciprocal velocity. These results give no indication of a resonance previously reported to exist in the thermal velocity region. The distributions in velocity of the neutrons emerging from paraffin at 300°K, 200°K, and at 135°K are obtained, and, as is expected, the colder the source the greater is the relative abundance of the slower neutrons. The effects of the resolution of the apparatus on both the cross section measurements and on the velocity distributions are investigated.

VITA

France Barnet Berger was born May 19, 1916 in Chicago, Illinois. He received his elementary education in the public schools of Camden, Ohio. He obtained the A. B. degree from Miami University, Oxford, Ohio in 1938 and the M. S. degree from the University of Illinois in 1939. He has done graduate work in physics at the University of Illinois since 1939. From 1939 to 1941 he has been a teaching assistant on part time. He was appointed to a University Fellowship during 1941-1942. He is affiliated with the following societies: Phi Eta Sigma, Sigma Pi Sigma, Phi Beta Kappa, Sigma Xi, Phi Kappa Phi, and the American Physical Society.

